Department of Pesticide Regulation

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Director

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Dear Integrated Pest Management Coordinator:

Below you will find information about resources the California Department of Pesticide Regulation (DPR) provides to help your school district start an integrated pest management (IPM) program, manage pests using IPM, and train your staff in IPM methods. This information includes some Web sites we recommend you bookmark to assist you with your IPM program.

DPR's California school IPM program Web site
This Web site provides a "Frequently Asked Questions" section about the Healthy Schools Act, pesticide use notification templates, a list of pesticide active ingredients, resources that describe and promote least-hazardous practices, links to information about public health and environmental impacts of pesticides, ways to reduce the use of pesticides at schools, and more.
<http://www.schoolipm.info>

Model IPM program guidebook
Whether you are just starting to implement an IPM program or want to improve an existing program, this guidebook will serve as a useful resource to answer your IPM questions and to provide practical, hands-on steps that can be implemented as part of your IPM program. The first part of this book lays out the essential elements of a least-hazardous IPM program and the steps to adopting an IPM program. Specific strategies for pest management indoors and outdoors are covered in the second part of the guidebook arranged by individual pests.
<http://www.cdpr.ca.gov/cfdocs/apps/schoolipm/managing_pests/guidebook.cfm?crumbs_list=1,5,37>

IPM curricula to train staff
We designed these curricula for districts that need resources to train their own staff. Each curriculum describes how to present a training workshop, and includes lists of tools and books you need as well as background information. Currently, we have curricula for burrowing rodents, yellowjackets, turf weeds, and landscape weeds.
<http://www.cdpr.ca.gov/cfdocs/apps/schoolipm/training/main.cfm?crumbs_list=1,39#curricula>

IPM training
DPR conducts IPM training workshops for school districts throughout the state every year. The workshop uses a hands-on, "walk-through" demonstration format, and focuses on the major pests of school buildings and landscapes. Locations, dates, and other information about the school IPM training workshops are announced at the Web site shown below.
<http://www.schoolipm.info/training/main.cfm?crumbs_list=1,39>

We have also enclosed a U.S. Environmental Protection Agency brochure that provides information about IPM and other resources that are available.

If you would like more information about California's program and its activities, please call me or e-mail me at <mbrattesani@cdpr.ca.gov>.

Sincerely,

Original signed by

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Enclosure

cc: DPR School IPM Advisory Group (w/Enclosure)

Seasonal Guide to Environmentally Responsible Pest Management Practices in Almonds

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University of California
Agriculture and Natural Resources
Leaflet 21619

The Almond Pest Management Alliance (PMA), a public/private partnership, is dedicated to the demonstration of environmentally responsible pest management practices to manage economic pests in almonds. The partnership includes the Almond Board of California, that board's Environmental Committee, UC Farm Advisors and Area IPM Advisors, the California Department of Pesticide Regulation, and the United States Environmental Protection Agency (EPA) Region 9.

This publication is a decision guide with information to help almond growers make environmentally responsible pest management decisions year-round without decreasing their yields or increasing their reject levels. When growers need to use pesticides to manage almond pests, they should give first consideration to environmentally friendly and low-toxicity materials (table 1). Some situations may require the use of a broad-spectrum insecticide (table 2). The information presented here is based on research and results from the University of California and the Almond Pest Management Alliance (PMA).

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YOUR PEST MANAGEMENT PROGRAM IS "ENVIRONMENTALLY RESPONSIBLE" IF YOU:

- **Monitor pest and beneficial insects and mites and spray only when chemical treatments are warranted.**
- **Tolerate low pest populations and do not treat for pests so long as they remain below economic threshold levels.**
- **Use effective environmentally friendly and less-toxic pesticides whenever possible.**
- **Opt for cultural controls or biological controls rather than chemical controls where possible.**
- **Avoid broad-spectrum insecticides unless pests exceed treatment thresholds *and* effective environmentally friendly insecticides are not available.**

Table 1. Environmentally friendly insecticides and their target pests

Insecticide class	Example trade names*	Target pests
Baits	Clinch, Distance	ants
Insect growth regulators	Clinch, Confirm, Dimilin, Distance, Esteem, Intrepid, Seize	ants, oriental fruit moth, peach twig borer, San Jose scale
Microbials (*Bacillus thuringiensis*)	Condor, Dipel, Javelin,	navel orangeworm, obliquebanded leafroller, peach twig borer
Miticides	Acramite, Agrimek, Apollo	European red and brown almond mites, Pacific and twospotted spider mites
Narrow-range oils	Gavicide Oil, Omni Oil, etc.	leafhoppers, mites, San Jose scale
Naturalytes (Spinosad)	Success	obliquebanded leafroller, peach twig borer

* Always check current pesticide registration.

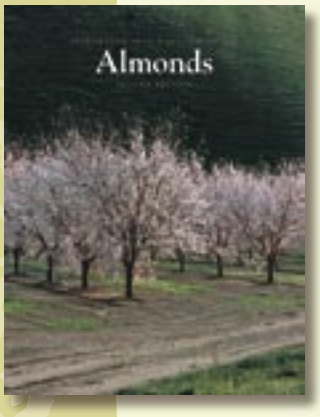
Table 2. Environmental characteristics of broad-spectrum pesticides

Insecticide class (oldest to newest)	Example trade names*	Environmental characteristics
Organochlorines† and cyclodienes	Kelthane, Thiodan	Sediment-bound organochlorines are transported in rain runoff and irrigation tailwater. Though banned from use in the 1970s, significant levels of DDT persist in areas of historically high use.
Carbamates	Lannate, Sevin	Generally not as toxic to aquatic life as organophosphates or pyrethroids. Relatively short-lived in water that has a basic pH.
Organophosphates	Diazinon, Guthion, Lorsban, Malathion, Supracide, Imidan	Highly toxic to mammals, birds, and aquatic invertebrates. Diazinon and Lorsban are frequently found in water. Imidan and Guthion may not pose as much of a threat to aquatic life as other organophosphate insecticides because they do not last long in water.
Pyrethroids	Ambush, Asana, Brigade, Danitol, Pounce	Relatively low toxicity to mammals and birds. Highly toxic to fish and certain aquatic invertebrates. Binds readily to particles, organic matter, and sediment. There is concern about long-term effects and toxicity to organisms that live on or in sediment.

* Always check current pesticide registration.
† Listed to provide historical perspective.

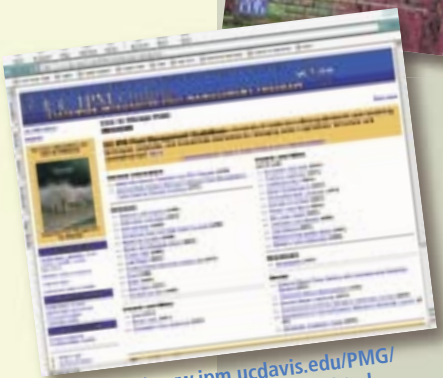
A SEASONAL APPROACH TO PEST MANAGEMENT

To manage pests in an environmentally friendly manner, you have to take a seasonal approach. Many of the most environmentally sound practices must be employed well before the target pests become a problem. It is also important to monitor for pests in the dormant period or early in the year before they reach thresholds that require treatment. Each season has its own set of activities to keep pests in check. The following **Seasonal Guide** outlines what you can do in your orchard at each time of year.



An effective program is based on good monitoring protocols. As an example, in the Kern County Almond PMA demonstrations year-long monitoring took 4 hours per acre at $10 per hour, an annual cost of $40 per acre (9.9 hours and $99 per hectare).

A detailed year-round integrated pest management plan for almonds that complements this leaflet and includes downloadable monitoring protocols, recordkeeping forms, and treatment suggestions, is available online at http://www.ipm.ucdavis.edu/PMG/selectnewpest.almonds.html, along with pest identification photos and *UC IPM Pest Management Guidelines: Almond*. You can also purchase a print copy of *UC IPM Pest Management Guidelines: Almond,* as well as the companion publications *Integrated Pest Management for Almonds* and *Tree Fruit Pest Identification and Monitoring Cards* from local University of California Cooperative Extension offices or on the Internet at http://anrcatalog.ucdavis.edu.



http://www.ipm.ucdavis.edu/PMG/selectnewpest.almonds.html

DORMANT PERIOD

Winter Sanitation to Reduce Navel Orangeworm Infestation

- Winter sanitation is the most effective control method for navel orangeworm.
- Count mummy nuts in 20 trees per block by January 15. Remove mummy nuts to fewer than 2 per tree before February 1.
- Make certain that overwintering mummy nuts with navel orangeworm inside have been destroyed by March 15, either from rotting in wet weather or from flail mowing. Because of low rainfall levels in the San Joaquin Valley, mummies there must be removed from herbicide strips and destroyed by flail mowing.

Dormant Sprays

What does a dormant oil spray control?

- Overwintering European red mite and brown almond mite eggs. These two species are much less damaging than the webspinning mites that can cause defoliation later in the growing year.
- San Jose scale (low to medium populations). High San Jose scale populations may require supplemental insecticides in the lower San Joaquin Valley, where they have been found to be resistant to insecticides. See population/treatment breakdowns in table 3.
- Soft scales such as the European fruit lecanium.
- *NOT* peach twig borer or webspinning mites.

What does a dormant oil plus insecticide spray control?

- Peach twig borer, obliquebanded leafroller, and high populations of San Jose scale.
- Beneficial insects and predatory mites are less affected by broad-spectrum pesticide applications during the dormant period than by similar insecticides applied during the growing season.

What does a dormant-applied insecticide spray *NOT* control?

- Navel orangeworm and oriental fruit moth. (During the dormant period they are in a stage that is unaffected by pesticides.)
- Webspinning mites that overwinter on the ground and in bark crevices on the lower trunk.
- Plant bugs that overwinter in broadleaf weeds and under debris. (They are very mobile and so are not controlled by dormant sprays.)

How to tell if you need a dormant spray for San Jose scale, brown almond mite, and European red mite

- **Dormant spur sampling:**
  - Collect 100 spurs (5 spurs from inside and outside the tree canopy of 20 trees in a block) anytime from early November through early January. If you collect from known hot spots you will be able to tell whether you need to spray for San Jose scale or mite eggs. Treatment thresholds are listed in table 3, which also tells you whether you need to add an insecticide to the dormant oil.
  - Examine 20 random spurs:
    - If no scale or mite eggs are found, no treatment is needed and no more spurs need be examined.
    - If 1 to 3 spurs are infested with scale, examine the next 20 spurs.
    - If at any time 4 or more spurs of each 20-spur sample are infested with live scale, apply a treatment.

Dormant spur

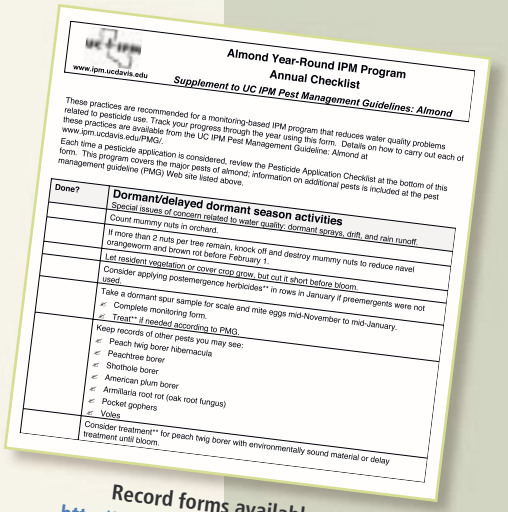
Table 3. Dormant treatment decision table based on percentage infested spurs*

Pest	Percentage infested spurs	Threshold
European fruit lecanium	24% or fewer	No spray
	Over 25%	Oil only
Overwintering mite eggs†	20% or fewer	No spray
	Over 20%	Oil only
San Jose scale	Below 5%	No spray
	5 to 10%	Oil at 4 to 6 gals/acre (37 to 56 L/ha)
	Over 10 to 60%	Oil at 6 gals/acre (56 L/ha)
	Over 60%	Oil with insecticide (see tables 1 and 2)

*Complete description of sampling method and sampling form can be found in *UC IPM Pest Management Guidelines: Almond*.

† Oil works best closer to delayed dormant timing or on warmer days when eggs are respiring. Dormant oil by itself does not provide adequate control for European red mites in Kern County.

- Continue examining spurs until you can make a decision to treat or not to treat based on the treatment guidelines on the sampling form. (A sampling form and a complete description of the sampling process can be found online at http://www.ipm.ucdavis.edu/FORMS/.) Do not combine totals for the two scale species. For example, if 3 spurs out of a sample of 20 are infested with San Jose scale and 3 spurs contain European fruit lecanium, neither has exceeded the threshold so you should continue to sample.



www.ipm.ucdavis.edu

Almond Year-Round IPM Program
Annual Checklist
Supplement to UC IPM Pest Management Guidelines: Almond

These practices are recommended for a monitoring-based IPM program that reduces water quality problems related to pesticide use. Track your progress through the year using this form. Details on how to carry out each of these practices are available from the UC IPM Pest Management Guideline: Almond at www.ipm.ucdavis.edu/PMG/.
Each time a pesticide application is considered, review the Pesticide Application Checklist at the bottom of this form. This program covers the major pests of almond; information on additional pests is included at the pest management guideline (PMG) Web site listed above.

Done?	Dormant/delayed dormant season activities
	Special issues of concern related to water quality, dormant sprays, drift, and rain runoff.
	Count mummy nuts in orchard.
	If more than 2 nuts per tree remain, knock off and destroy mummy nuts to reduce navel orangeworm and brown rot before February 1.
	Let resident vegetation or cover crop grow, but cut it short before bloom.
	Consider applying postemergence herbicides** in rows in January if preemergents were not used.
	Take a dormant spur sample for scale and mite eggs mid-November to mid-January. ☞ Complete monitoring form. ☞ Treat** if needed according to PMG.
	Keep records of other pests you may see: ☞ Peach twig borer hibernacula ☞ Peachtree borer ☞ Shothole borer ☞ American plum borer ☞ Armillaria root rot (oak root fungus) ☞ Pocket gophers ☞ Voles
	Consider treatment** for peach twig borer with environmentally sound material or delay treatment until bloom.

Record forms available at
http://www.ipm.ucdavis.edu/FORMS/

How to tell if you need a dormant spray for peach twig borer

- There are no established general thresholds. Threshold levels are unique to each orchard.
- Base your treatment decision on a harvest sample from the block.
- If damage exceeded an acceptable level and this was not related to a harvest delay, apply an insecticide with the dormant spray.
- Consider alternatives. These may include environmentally friendly insecticides listed in table 1 or other treatment timings that help keep insecticides out of runoff water.

Dormant treatment options

- Delayed dormant treatments provide better pest control for overwintering mite eggs.
- Dormant insecticide applications every other year generally will keep pest populations low.
- Environmentally friendly options include:
  - Dormant oil alone —
    - Use 6 gallons of oil per acre (56 L/ha) to control San Jose scale (treatment guidelines in table 3).
    - Dilute treatments at 200 gallons per acre (1872 L/ha) provide better spray coverage and work better with heavy San Jose scale populations. If trees are more than 18 to 20 feet (5.5 to 6.1 m) tall you may need to use 400 gallons per acre (3744 L/ha).
  - Other environmentally friendly insecticide options are listed in table 1.

Alternatives to dormant spray

- Effective in-season treatments include bloom, May, or hull-split spray timings for peach twig borer, using environmentally friendly insecticides (see table 1). The peach twig borer spray that best protects the crop is applied at early hull split.

Navel orangeworm mummy nut removal

How to mitigate the environmental impact of the insecticide once monitoring determines the need for a dormant-applied insecticide

- Calibrate your sprayer.
- Consider in-season spray timings for peach twig borer and obliquebanded leafroller.
- Monitor weather forecasts and avoid spraying when soil is saturated and rain is predicted.
- Do not make an application just before a forecast rain in high-rainfall areas.
- In high-rainfall areas, spread dormant applications in different blocks between November 1 and February 1. (Earlier applications allow the pesticides to degrade before the first rains in the season can cause runoff.)
- Mix, load, and clean equipment away from areas where waste water or residues might run off into surface water. Take care to avoid contamination of surface water when rinsing the sprayer.
- Minimize spray drift by shutting the sprayer off while turning at the end of a row or when near a water body.
- Avoid spraying in foggy weather.

BLOOM/POST-BLOOM PERIOD

(February through May)

Almond bloom

Critical Pest Management Activities

- Time fungicide applications to prevent disease when rainfall is forecast.
- Choose most effective fungicides for your disease pressure (see Fungicide Efficacy and Timing for Deciduous Tree Fruit and Nut Crops and Grapevines at http://www.ipm.ucdavis.edu/PMG/selectnewpest.almonds.html).
- Apply fungicides during the most susceptible period for each disease.
- Consider varietal differences in susceptibility to disease.
- Consider bloom-time *Bacillus thuringiensis* (Bt) sprays for peach twig borer.

Fungus Disease Control

- **Brown rot, blossom blight, jacket rot, and anthracnose**
  - Brown rot control is necessary if there is rainfall during bloom.
  - In the southern San Joaquin Valley, a single application at 80 to 100 percent bloom is usually sufficient for brown rot control.
  - After petal fall, jacket rot (*green fruit rot*) and anthracnose require control until rainfall stops.
  - Nuts are susceptible to anthracnose until spring rains stop.
- **Shothole fungus**
  - Shothole fungus can become an epidemic problem once trees leaf out and the secondary disease cycle begins with spores dispersed by splashing rain.
  - Look for the fungal fruiting structure (*sporodochia*) in leaf lesions in March to early April.
  - In the southern San Joaquin Valley, spray in the spring if you find sporodochia in the fall.
  - If sporodochia are present and rainfall is forecast, apply protective fungicides.
  - In the southern San Joaquin Valley, nuts are no longer affected by shot hole after they reach ½ inch (about 1 cm) in diameter. In the Sacramento Valley with high rainfall, full-sized nuts can drop from shot hole in late April.

Shothole fungus sporodochia

- **Almond scab**
  - Spores are spread by splashing rain.
  - Almond scab causes leaf lesions and defoliation if rainfall occurs after overwintering twig lesions have formed spores in mid-April.
  - Fungicide protection is necessary if rain occurs in mid- to late spring in the Sacramento and northern San Joaquin Valleys.
  - Almond scab is often controlled with fungicide sprays applied for shothole disease.
- **Rust**
  - Monitor in fall in the San Joaquin Valley. If orchard trees had lesions in the fall, monitor from April to June. If any lesions are found in early to mid-season, growers should spray to prevent premature defoliation (*UC IPM Pest Management Guidelines: Almond*).
- **Alternaria**
  - Problems are currently most severe in the southern San Joaquin Valley, but they appear to be increasing in the Sacramento Valley.
  - Monitor from May to June.
  - Follow recommendations in the *UC IPM Pest Management Guidelines: Almond.*
- **Hull rot**
  - No chemical control is available for hull rot.
  - Irrigation management is the most important means of cultural control.
    - Mild water stress for 2 weeks starting at hull split is effective.
    - Avoid unnecessarily frequent irrigations during the entire hull-split period.
    - Do not allow standing water in the orchard during hull split.
  - Manage nitrogen to keep nitrogen leaf levels below 2.6 percent in the July leaf sample.

Table 4. Placing traps for insect pest monitoring

Insect pest	Trap placement date	Purpose
Navel orangeworm (eggs)	April 1	Monitor biofix and determine hull-split spray timing.
Oriental fruit moth	February 15	Monitoring needed only in orchards with a history of damage.
Peach twig borer	March 20	Determine biofix for each generation. Use degree-days (see *UC IPM Pest Management Guidelines: Almond*) to determine May spray and hull-split spray timing.
San Jose scale	February 25 (San Joaquin Valley) March 1 (Sacramento Valley)	Determine biofix (see IPM website, http://www.ipm.ucdavis.edu). Monitor beneficials.

IN-SEASON PERIOD

Critical Pest Management Activities (Based on Trap Catches)

- Use traps to monitor insect pests. You can use San Jose scale traps to monitor the beneficials that prey on San Jose scale. Trap placement date and use are outlined in table 4.
- Keep track and compare each crop year's trap catch totals to develop a general feel for population trends.
- May sprays
  - Spray applications in May are most important on young almond trees to prevent shoot strikes from peach twig borer.
  - May sprays may be useful if the orchard has a history of high levels of peach twig borer damage.
  - Make sure to use environmentally friendly chemicals (see table 1).

Peach twig borer trap

Environmentally Responsible Pest Management Practices

- **San Jose scale**
  - If you find no beneficial insects in your San Jose scale traps, you may eventually need to treat the orchard for pests. To make this determination, monitor populations on dormant spurs.
  - San Jose scale is best treated during the dormant period.
  - Apply 6 gallons of oil per acre (56 L/ha) during the dormant period for high populations (see thresholds in table 3).
  - Apply narrow-range oils for crawlers in-season, which are easily seen on wood when populations are high.
- **Peach twig borer**
  - Most blocks need only one peach twig borer treatment per year. There are four treatment options: dormant, bloom, May, or hull split.
  - *Monitoring in-season population levels for peach twig borer:* To determine population levels, monitor shoot strikes at 600 degree-days from first biofix to determine whether peach twig borer or oriental fruit moth is present in the block. Shoot strikes are easier to find on replants. Record the average number of shoot strikes per tree each year, and if populations increase consider a treatment for peach twig borer.
  - Use environmentally safe insecticides (listed in table 1). The *UC IPM Pest Management Guidelines: Almond* will give you current information on the best timing and rates for each product.
  - *Hull-split spray:* Compare the degree-days to the hull-split date. If this gives you reason to expect peach twig borers to hatch at hull split, consider your spray options.
    - Choose environmentally friendly insecticides applied at the proper time.
    - If there's a history of high peach twig borer levels based on harvest samples or grade sheet data and you have made no other applications for the pest, consider using a currently registered broad-spectrum insecticide listed in table 2.
- **Navel orangeworm**
  - If you practice winter sanitation (orchard is thoroughly cleaned to fewer than 2 mummies per tree), hull-split sprays are not generally necessary unless mated female navel orangeworms fly in from adjacent areas. Studies have shown that even well-timed hull-split sprays are often no more than 50 percent effective.
  - There may be a potential for high navel orangeworm damage in years when degree-days show more than 3.5 generations of the pest by harvest or when winters are dry and navel orangeworm survives well in mummy nuts.
  - Navel orangeworm damage is likely to be low when degree-days show fewer than 2 generations per year or when winters are severe and few overwintering mummies survive.
  - If a hull-split spray is necessary:
    - Once hull split begins, look for navel orangeworm egg laying on traps. If you find evidence of egg laying, consider applying environmentally friendly insecticides as listed in table 1. Apply at 1 to 2 percent hull split to control both peach twig borer and navel orangeworm. Make sure to make the application before 10 percent hull split.

Almond nuts growing

- Two *Bacillus thuringiensis* applications—one at hull split and one 7 to 10 days later—have been shown to be as effective as a single application of an organophosphate insecticide.
- Harvest Nonpareil almonds as early as possible to avoid navel orangeworm egg laying.
- If there were more than 2 mummies per tree in January, you did no winter sanitation of the orchard, egg traps show high levels of egg laying activity, and navel orangeworm damage was high (based either on the previous year's harvest sample or on grade sheet data), use a currently registered insecticide listed in table 2.

Hull split

- **Webspinning mites**
  - Minimize dust and avoid water stress. You can usually avoid water stress by following proper irrigation practices and by promoting practices that allow for good water infiltration. If soils have a tendency to surface seal, use either gypsum, a light tillage operation, or vegetation (barley is used in the lower San Joaquin Valley) in the orchard middles to enhance water infiltration.
  - Use the presence/absence sampling technique to monitor mite populations and use threshold levels from the *UC IPM Pest Management Guidelines: Almond* to determine the need for spray applications.
  - Avoid pyrethroid and carbamate pesticides since they may cause an increase in mite populations. Organophosphates are less likely to cause mite problems.
  - Use environmentally friendly insecticides (see table 1) to preserve mite predators, especially western predatory mite and sixspotted thrips.
  - Environmentally friendly control practices:
    - Release predatory mites early in the season.
    - Identify hot spots in the orchards and spot-treat with miticides to prevent any spread of the mite problem.
    - Use summer oils.
    - Use low rates of miticides when mite predators are present.

Table 5. Treatment threshold for ants

Number of colonies per 5,000 sq ft (465 m²) (approx. five 10-tree sampling areas)	Days between shaking and pickup				
	4	7	10	14	21
	% damaged nuts at harvest				
15 colonies	0.9	1.6	2.1	3.1	4.9
45 colonies	1.4	2.3	3.2	4.7	7.0
185 colonies	2.0	3.6	5	7.0	11.1

- **Ants**
  - Monitor ant mounds in May and June. Correctly identify the ant species. Only southern fire ants and black pavement ants feed on almonds.
  - Treatment is necessary if 10 to 15 mounds are found within a 5,000-square-foot (465 m²) area and nuts are picked up in 4 to 5 days. For example, if a planting is 20 feet square (6.1 meters square), a middle that is two tree spaces long has an area of 800 square feet (74.3 m²). Count the ant mounds in 6 representative 800-square-foot locations to total an area of 4,800 square feet (446 m²). Use the data in table 5 (based on the number of ant mounds per 5,000 square feet [465 m²]) to determine whether you will reach a threshold for a bait application.
  - Use baits such as Clinch or Distance. Baits are slower to control ants and should be considered a long-term management strategy. These baits
    - are harmless to beneficial ant species.
    - are less harmful to the environment than broad-spectrum insecticides (table 2).
    - must be applied 6 to 8 weeks before harvest.
    - may not be effective when used with a cover crop or when spotted spurge is present. Ants are more attracted to spotted surge seeds than to the bait.
  - If ants are the primary pest, let the nuts dry on the trees as long as is feasible. That way the nuts will spend less time on the ground where they are exposed to ant feeding. This strategy is the opposite of navel orangeworm management and should only be used where that pest is not a problem. Tailor your harvest strategy to fit the pest control needs of your orchard.

Peach twig borer shoot strikes

- **Hull rot**
  - Look for evidence of hull rot as harvest approaches, especially on Nonpareil and Sonora almonds.
  - Avoid late harvest, over-irrigation, and overfertilization.

HARVEST PERIOD

Critical Pest Management Activities

- Harvest nuts early in order to
  - avoid a third or fourth generation of egg laying for navel orangeworm.
  - reduce damage from hull rot.
- Pick up nuts promptly to prevent ant damage that can come with prolonged exposure on the ground.
- It is critical that you monitor damage levels at harvest so you can evaluate your pest management problems. Grade sheets often underestimate damage and fail to correctly identify the pest causing the damage. Your own in-hull almond harvest sample will be more accurate. You can use it to identify problems correctly so that you can reduce future reject levels and possibly eliminate unnecessary insecticide applications.
  - Collect a 500-nut sample from windrows before picking up the nuts.
  - Crack out and record damage from peach twig borer, navel orangeworm, ants, plant bugs, and oriental fruit moth (refer to photographs in this leaflet and in *Integrated Pest Management for Almonds* to identify the cause of each type of damage).
  - This information will help you make necessary modifications to your pest management program for the following crop year.

Peach twig borer damage to nuts

Navel orangeworm damage to nuts

POSTHARVEST PERIOD

Critical Pest Management Activities

Evaluate pest and disease pressure; plan for next year.

- **San Jose scale**
  - Look for yellow leaves or dead leaves stuck to spurs.
  - Search spurs and watersprouts for presence of scale white cap and black cap stages.
- **Hull rot**
  - Look for evidence, such as nuts stuck on the tree or leaves stuck onto dead twigs.
  - Harvest early, keep nitrogen levels lower, and improve irrigation management.
- **Leaf blight infections (not usually a problem in the San Joaquin Valley)**
  - Look for dead leaves with a small dead spot on the twig at the base of the dead leaves' petioles, which may be stuck to spurs and twigs throughout the canopy.
  - Disease increases when there are late spring or summer rains. Spray next season to prevent disease recurrence.
- **Rust**
  - Monitor rust lesions in the fall.
- **Shothole fungus (southern San Joaquin Valley)**
  - Look for sporodochia in the fall to determine the need for fungicide spraying in spring.

Ant damage to nuts

You'll find more information on almond production, pest management, and other topics in the many publications, slide sets, CD-ROMs, and videos from UC ANR. Visit our online catalog at http://anrcatalog.ucdavis.edu, place orders by mail, phone, or FAX, or request a printed catalog from

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